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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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09/715,576

11/17/2000

Hua-Shuang Kong

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12/28/2007

SUMMA, ALLAN & ADDITON, P.A.

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SUITE 200

CHARLOTTE, NC 28277

EXAMINER

KACKAR, RAM N

ART UNIT

PAPER NUMBER

1792

MAIL DATE

DELIVERY MODE

12/28/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

09/715,576

Applicant(s)

KONG ET AL.

Examiner

Ram N. Kackar

Art Unit

1792

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 09 November 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 22,24,49 and 50 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 22,24,49 and 50 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 11/9/07.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. **Claims 22, 24, 49 and 50 are rejected under 35 U.S.C. 103(a) as obvious over M Pradetto (DE 3827506) in view of Martin et al (US 4579080).**

M Pradetto discloses a reactor vessel of quartz (Fig 1-5 and Col 3 line 42) which would make it transparent to electromagnetic radiation, having a gas supply system (3), induction coils as a source of electromagnetic radiation (19), being barrel type (Fig 1), thermally responsive, hollow inverted type of susceptor with a plurality of wafer pockets on the inner circumference (1) made of thermally responsive graphite coated with silicon carbide, defined by a plurality of planer surfaces connected at adjacent sides, spaced optimally to allow flow of reactive gases without obstruction as well as allow them to heat each other (Fig 1), and plurality of pockets to receive substrates which could be loaded with robotic transfer mechanism.

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M Pradetto further teaches that the substrates are parallel to each other and contribute to heating each other so as to have uniform heating.

M Pradetto does not disclose a water inlet for introducing water into a space between said reaction vessel and said source of electromagnetic radiation to form a water jacket to circulate water against an outer surface of said reaction vessel.

Martin et al disclose a reactor vessel containing susceptor made of a thermally responsive material, graphite, coated with silicon carbide (Col 7 line 60) heated by induction coils as a source of electromagnetic radiation. Martin et al further teach a water inlet for introducing water into a space between said reaction vessel and said source of electromagnetic radiation to form a water jacket to circulate water against an outer surface of said reaction vessel and teach that this temperature control of the walls is important to avoid unwanted deposition on the walls (Col 11 lines 57-Col 12 lines 17).

Therefore it would have been obvious for one of ordinary skill in the art at the time of invention to have a water jacket around reactor vessel of M Pradetto in order to avoid unwanted deposition on it.

4. Claims 22, 24, 49 and 50 are rejected under 35 U.S.C. 103(a) as obvious over Martin et al (US 4579080) in view of M Pradetto (DE 3827506).

Martin et al disclose a reactor vessel containing susceptor made of a thermally responsive material, graphite, coated with silicon carbide (Col 7 line 60) heated by induction coils as a source of electromagnetic radiation. Martin et al further teach a water inlet for introducing water into a space between said reaction vessel and said source of electromagnetic radiation to form a water jacket to circulate water against an outer surface of said reaction vessel and teach that this

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temperature control of the walls is important to avoid unwanted deposition on the walls (Col 11 lines 57-Col 12 lines 17).

Martin et al do not disclose susceptor made of sections connected at adjacent sides, to form a hollow inverted truncated cone with a plurality of wafer pockets on the inner circumference of said truncated cone.

M Pradetto discloses a reactor vessel of quartz (Fig 1-5 and Col 3 line 42) which would make it transparent to electromagnetic radiation, having a gas supply system (3), induction coils as a source of electromagnetic radiation (19), being barrel type (Fig 1), thermally responsive, hollow inverted type of susceptor with a plurality of wafer pockets on the inner circumference (1) made of thermally responsive graphite coated with silicon carbide, defined by a plurality of planer surfaces connected at adjacent sides, spaced optimally to allow flow of reactive gases without obstruction as well as allow them to heat each other (Fig 1), and plurality of pockets to receive substrates which could be loaded with robotic transfer mechanism. M Pradetto further teaches that the substrates are parallel to each other and contribute to heating each other so as to have uniform heating.

Therefore it would have been obvious for one of ordinary skill in the art at the time of invention to have a susceptor of the type as in M Pradetto for reactor of Martin et al as being equivalent and superior in heating uniformity.

5. Claims 22, 24, 49 and 50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Thomas F Briody (US 3659552) in view of Ryoza Sato (JP 64025541) and further in view of Martin et al (US 4579080).

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Thomas F Briody discloses a reactor vessel of quartz (Fig 1-13 and Col 2 lines 38-41) which would make it transparent to electromagnetic radiation, having a gas supply system (29), induction coils as a source of electromagnetic radiation (41), being barrel type (Fig 1), thermally responsive, hollow inverted type of susceptor (15) made of thermally responsive graphite (Col 1 lines 42-54), defined by a plurality of planer surfaces (Fig 2 and 3-18) on the inside of a cylindrical susceptor (connected at adjacent sides), spaced optimally to allow flow of reactive gases without obstruction as well as allow them to heat each other (Fig 1), and plurality of pockets to receive substrates (Fig 1).

Thomas F Briody does not disclose that its susceptor is made by planer sidewall sections connected at sides. It is noted that individual parts of the susceptor which hold the wafers, though not appearing to be manufactured in planer sections are nevertheless planer and integrally joined to other parts. It is also evident that they perform in the same way.

However, Ryozo Sato discloses a similar apparatus with a cylindrical susceptor in a quartz reaction tube having planer surfaces inside to support substrates and is disclosed inductively heated. Further, this structure is disclosed to be made of sections connected together (Fig 6) and the sections could be individual planer sections (Fig 7). A structure like this especially for larger substrates would be better to enable load/unload of substrates.

Therefore modifying the apparatus of Briody et al according to the teaching of Ryozo Sato in order for getting manufacturing advantage in case of larger substrates and additionally for load/unload convenience would be obvious to one of ordinary skill in the art at the time of invention.

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Thomas F Briody as modified by Ryoza Sato discloses a reactor vessel containing thermally responsive graphite (Col 1 lines 42-54) but do not disclose graphite coated with silicon carbide and a water inlet for introducing water into a space between said reaction vessel and said source of electromagnetic radiation to form a water jacket to circulate water against an outer surface of said reaction vessel.

It is well known that graphite is coated with silicon carbide to prevent migration of carbon in to silicon substrate.

Martin et al disclose a reactor vessel containing susceptor made of a thermally responsive material, graphite, coated with silicon carbide (Col 7 line 60) heated by induction coils as a source of electromagnetic radiation. Martin et al further teach a water inlet for introducing water into a space between said reaction vessel and said source of electromagnetic radiation to form a water jacket to circulate water against an outer surface of said reaction vessel and teach that this temperature control of the walls is important to avoid unwanted deposition on the walls (Col 11 lines 57-Col 12 lines 17).

Therefore it would have been obvious for one of ordinary skill in the art at the time of invention to coat graphite susceptor of Thomas F Briody by silicon carbide in order to prevent migration of carbon. Further it would also be obvious have a water jacket around reactor vessel in order to avoid unwanted deposition on it.

6. Claims 22, 24, 49 and 50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Thomas F Briody (US 3659552) in view of Kobayashi et al (JP 62257720) and further in view of Martin et al (US 4579080).

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Thomas F Briody discloses a reactor vessel of quartz (Fig 1-13 and Col 2 lines 38-41) which would make it transparent to electromagnetic radiation, having a gas supply system (29), induction coils as a source of electromagnetic radiation (41), being barrel type (Fig 1), thermally responsive, hollow inverted type of susceptor (15) made of thermally responsive graphite (Col 1 lines 42-54), defined by a plurality of planer surfaces (Fig 2 and 3-18) on the inside of a cylindrical susceptor (connected at adjacent sides), spaced optimally to allow flow of reactive gases without obstruction as well as allow them to heat each other (Fig 1), and plurality of pockets to receive substrates (Fig 1).

Thomas F Briody does not disclose that its susceptor is made by planer sidewall sections connected at sides.

Kobayashi et al disclose a similar apparatus with a cylindrical susceptor having planer surfaces inside to support substrates and is disclosed heated from outside. Further, this structure is disclosed to be made of sections connected together (Fig 1) and the sections could be individual planer sections. A structure like this especially for large substrates would be convenient to manufacture.

Therefore modifying the apparatus of Briody et al according to the teaching of Kobayashi et al in order for getting manufacturing advantage in case of large substrates would be obvious to one of ordinary skill in the art at the time of invention.

Thomas F Briody as modified by Kobayashi et al discloses a reactor vessel containing thermally responsive graphite (Col 1 lines 42-54) but do not disclose graphite coated with silicon carbide and a water inlet for introducing water into a space between said reaction vessel and said

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source of electromagnetic radiation to form a water jacket to circulate water against an outer surface of said reaction vessel.

It is well known that graphite is coated with silicon carbide to prevent migration of carbon in to silicon substrate.

Martin et al disclose a reactor vessel containing susceptor made of a thermally responsive material, graphite, coated with silicon carbide (Col 7 line 60) heated by induction coils as a source of electromagnetic radiation. Martin et al further teach a water inlet for introducing water into a space between said reaction vessel and said source of electromagnetic radiation to form a water jacket to circulate water against an outer surface of said reaction vessel and teach that this temperature control of the walls is important to avoid unwanted deposition on the walls (Col 11 lines 57-Col 12 lines 17).

Therefore it would have been obvious for one of ordinary skill in the art at the time of invention to coat graphite susceptor of Thomas F Briody by silicon carbide in order to prevent migration of carbon. Further it would also be obvious have a water jacket around reactor vessel in order to avoid unwanted deposition on it.

Response to Arguments

Applicant's arguments filed 11/9/2007 have been fully considered but they are not persuasive.

Applicant argues that Pradetto does not teach a plurality wafer pockets.

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This argument is not understood since wafers are shown held on vertical sections of the susceptor and are also shown in drawing Fig 2- 6 and obviously they would be in some kind of recess.

Regarding Sato, applicant argues that it cannot overcome the deficiencies of Briody.

It is noted that Sato is used to show that in prior art susceptors assembled together with sections which obviously look planer have been used to work and perform in the same way. The fact that Sato has a centrally located cooling tube and has a slightly different mode of operation is not enough to deter one of ordinary skill in the art to use its teaching to assemble a susceptor from planer sections especially for larger area wafers.

Regarding Kobayashi et al, applicant argues that Kobayashi illustrates another annular ring like member. In response it is noted that unlike Briody Kobayashi discloses susceptor made of planer sections, larger than the wafers as seen in the plan view (Fig 2) and side view (Fig 1).

Applicant's argument against Martin et al is similarly unpersuasive.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

US 5119540 to Kong et al discloses water jacket for cooling the reactor vessel walls.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

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A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ram N. Kackar whose telephone number is 571 272 1436. The examiner can normally be reached on M-F 8:00 A.M to 5:P.M.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on 571 272 1435. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Ram Kackar
Primary Examiner AU 1792